URBAN AREAS CONGESTION RELIEF ANALYSIS
WORK PROGRESS REPORT

BRIEFING PAPER
Prepared for the
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PURPOSE:

Brief the Commission on major findings of Phase 1 of the Congestion Relief Analysis (CRA) for Puget Sound, Spokane and Vancouver urban areas. The analysis was conducted to fulfill the analytical requirements of ESHB 1163 Sec. 222(1) and ESHB 2474 Sec. 220 (1). It includes two phases. Phase 1 takes a global look at the transportation systems in the three urban areas. Phase 2 will take a close look at specific strategies (such as congestion pricing) at the corridor level focusing on the central Puget Sound region.

ACTION/OUTCOME:

This is a discussion item. No action is requested.

BACKGROUND:

In Washington State's major urban areas, over the past thirty years the growth in travel demand has outpaced expansion of transportation system capacity. Additionally, planned improvements in highway system capacity lack funding, leaving the state with a growing backlog of capacity needs. The growing demand/capacity imbalance affects citizens' daily lives and almost every sector of economic activity. Commutes to work are time-consuming and often aggravating. Non-work trips, too, must be planned to avoid congestion or with an extra time allowance to account for the lack of reliability in travel times. Freight delivery becomes slower and less reliable. Air pollution is exacerbated by cars and trucks stuck in traffic. Even rural areas that have never seen traffic jams are penalized when highway congestion interferes with their agricultural products reaching ports and customers.

This situation could become even bleaker when our state's population increases by over two million people by the year 2025, equivalent of dropping twelve cities the size of Vancouver, or ten cities the size of Everett into the state.

In 2003, the Washington State Legislature directed the Washington State Department of Transportation (WSDOT) to study congestion in the form of delay both now and in the future in our state's major urban areas, Spokane, Puget Sound and Vancouver. It requires that "The study must include proposals to alleviate congestion consistent with population and land use expectations under the growth management act, and must include measurement of all modes of transportation" (ESHB 1163 Sec. 222(1)).

The study's purpose was not to develop a plan for solving our congestion problems, but to provide information for policy makers to use in evaluating choices the state will be required to make to address the growing delay in the urban areas.

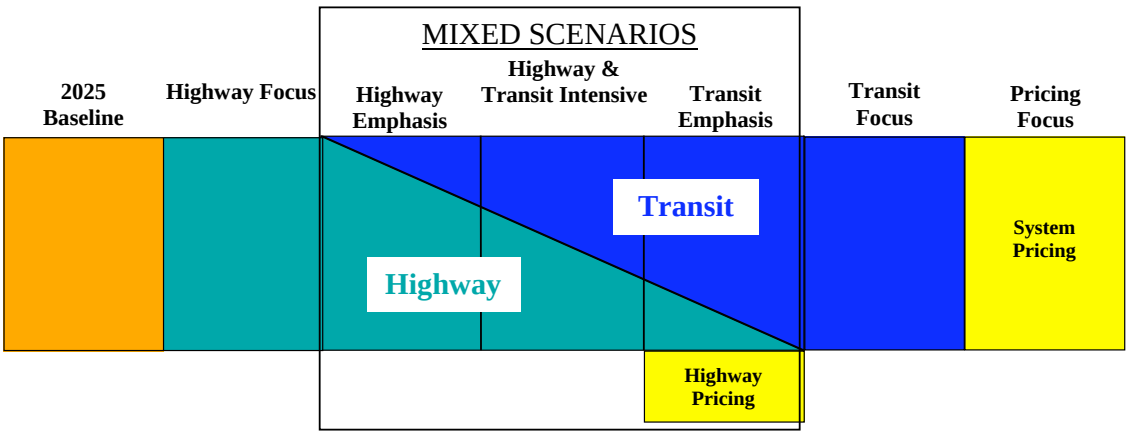
Three separate but coordinated studies were conducted for the Central Puget Sound, Vancouver and Spokane regions. Each region employed a computerized travel model to forecast future travel patterns in order to assess what congestion might look like in the year 2025. Projected travel demands were based on regionally adopted growth plans and forecasts of population and employment. A series of investment scenarios were then modeled to project how traffic congestion could be reduced utilizing highway investments, transit investments, pricing (tolling) or combinations of the three.

HIGHLIGHTS OF THE SCENARIOS ANALYZED AND MAJOR FINDINGS

Washington will continue to grow at a rapid pace adding about two million people and 900,000 jobs by 2025. Nearly 70% of population and 80% of employment growth will occur within the three urban areas of central Puget Sound, Vancouver and Spokane. That translates into increased travel demand – 45 million more miles per day of travel; over a 50% increase from today. Travel delay will increase by three to four fold in all the three major urban areas.

The analysis looked at a range of transportation scenarios including single mode approaches, mixed mode strategies and congestion pricing. Figure 1 illustrates the scenarios evaluated in Phase 1 of the study.

Figure 1. Scenarios Analyzed in Phase 1



The following summarizes the findings from the Phase 1:

1. Congestion can be relieved by building highways, but the cost and impacts will be very high.

The study modeled and estimated the cost for a highway expansion scenario called Highway Focus Scenario. Table 1 shows the number of lanes miles added in the Highway Focus Scenarios in the three urban areas. In the central Puget Sound region, for example, the Highway Focus Scenario added 3 lanes each direction from Tacoma to Everett and three to four lanes each direction on I-405. In the Vancouver area, I-5 and I-205 across the Columbia River added three lanes and one lane each direction, respectively. In Spokane, I-90 through Downtown Spokane added four lanes each direction.

Table 1. Lane Miles Added in the Highway Focus Scenarios In the Three Urban Areas

Urban Area	Freeway		Arterials		Total		Cost ($Billions)
	Miles	% Increase	Miles	% Increase	Miles	% Increase	
Puget Sound	1,230	52%	730	7%	1,960	16%	$80-104
Spokane	137	60%	382	25%	518	30%	$6.8-8.9
Vancouver	100	45%	186	25%	286	29%	$3.1-4.1

The analysis showed that travel times for many commute trips would be greatly improved in 2025 as compared to the baseline (existing plus funded projects). However, they would only keep the congestion from getting slightly worse than today. On the other hand, these improvements would cost many billions of dollars. In the urban cores, the cost of building the highway expansions necessary to relieve congestion are likely to exceed the traveler benefits.

For example: to serve the growing demand on I-5 through downtown Seattle, adding six lanes for ten miles was tested in the Highway Focus scenario. A tunnel was assumed for this segment due to the right-of-way limitations and very high property costs in downtown Seattle. The cost of this tunnel could be $150-200 million per lane mile, for a total cost in the vicinity of $10 billion (2003 dollars). If the tunnel were built, it is estimated that daily congestion on I-5 could be reduced from 10 hours to 7 hours in 2025 (today it is 8 hours).

2. Massive transit expansion can serve a large number of trips in the heavily traveled corridors during peak commuting periods; but transit does little to reduce congestion.

A Transit Focus Scenario was developed in each region to test an aggressive expansion in transit infrastructure and service. In the central Puget Sound region, the Transit Focus Scenario would double the number of service hours compared with the 2025 Baseline (or nearly quadruple the existing services) and would add 176 miles of High-Capacity Transit (HCT) facilities (see Table 2). In Vancouver, transit service hours would increase

by around 150% combined with over 21 miles of HCT. In Spokane, the expansion of transit service hours was 38 percent, but 31 miles of HCT were added in the scenario.

Table 2. Transit Service and Facilities Added in Transit Focus Scenarios*

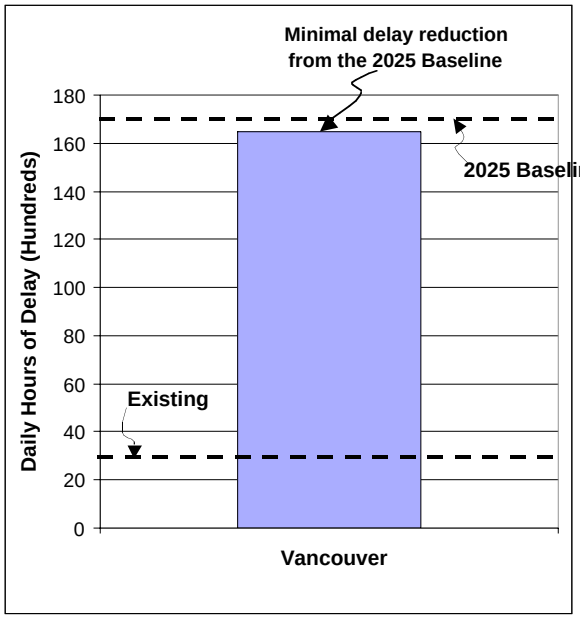
	Central Puget Sound		Vancouver		Spokane	
	Units	**% Increase**	**Units**	**% Increase**	**Units**	**% Increase**
Transit Service Hours**	26,000 hours	104%	1,338 hours	149%	1,750 hours	38%
Miles of High Capacity Transit (HCT)	176 miles	490%	21 miles	No Previous HCT	31 miles	No Previous HCT

* Compared to 2025 Baseline

** Average Weekday Bus Equivalent Revenue Hours

By modeling the Transit Focus Scenario using the regional models, it was found that transit investments could be effective in moving people during peak periods in densely developed urban corridors. For example: Across Seattle's Ship Canal, close to 25 percent of total person trips, or about 270,000 per day would use transit, many in High Capacity Transit. However, at the system level, transit's effect on reducing highway delay is small. This is because the projected growth in population and employment, and consequently increased vehicle travel, would far exceed the number of trips shifted to transit, resulting in little relief to highway congestion. Figure 2 compares modeled 2025 total hours of delay for the Transit Focus Scenario to the existing and 2025 baseline conditions.

Figure 2. Daily Hours of Delay in the Transit Focus Scenario for Vancouver



3. Congestion pricing, or roadway tolling, shows significant potential to reduce congestion.

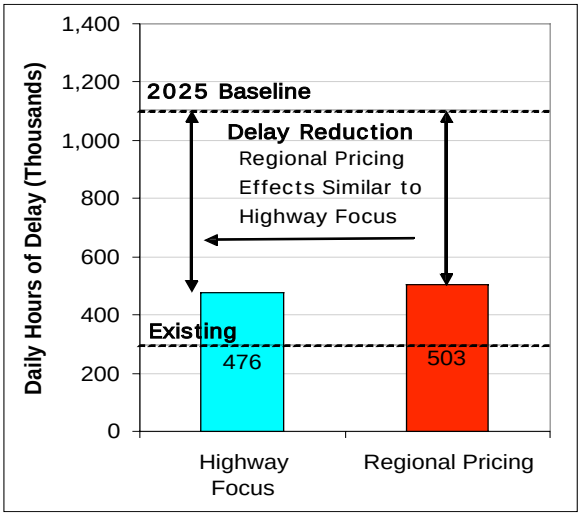
To test the potential effects of congestion pricing, the study analyzed a system wide tolling scenario called Pricing Focus Scenario. The Pricing Focus Scenario assumes that every roadway in the Puget Sound and Vancouver areas would be tolled when certain traffic conditions are met. For a given roadway, the toll starts at zero and then increases as congestion increases in order to moderate the demand that leads to further congestion.

Under this scenario, the higher the congestion, the higher the toll. The tolls would be based on mileage and rates would range from 0 to 50 ¢ per mile. Pricing was not analyzed in Spokane.

The Pricing Focus Scenario's underlying objective was to manage travel demand through tolling in an effort to make more efficient use of existing capacity. Pricing can achieve this by encouraging some users to alter their travel behavior (particularly during congested times) by using other routes, shifting to transit or carpools, changing their destinations (making shorter trips), and even potentially changing their time of travel or eliminating some trips.

Through computer modeling, it was found that variable pricing according to the level of demand/congestion was very effective in reducing delay by making more efficient use of available capacity. Because its capital investment is limited solely to toll collection and operating equipment, with no capacity improvements, the Pricing Focus Scenario has substantially lower overall annualized costs. With only 2-3% of the cost of the Highway Focus Scenario, the Pricing Focus Scenario could provide a similar amount of delay reduction.

Figure 3. Delay Savings for Regional Pricing Compared to Highway Focus Scenarios in the Central Puget Sound



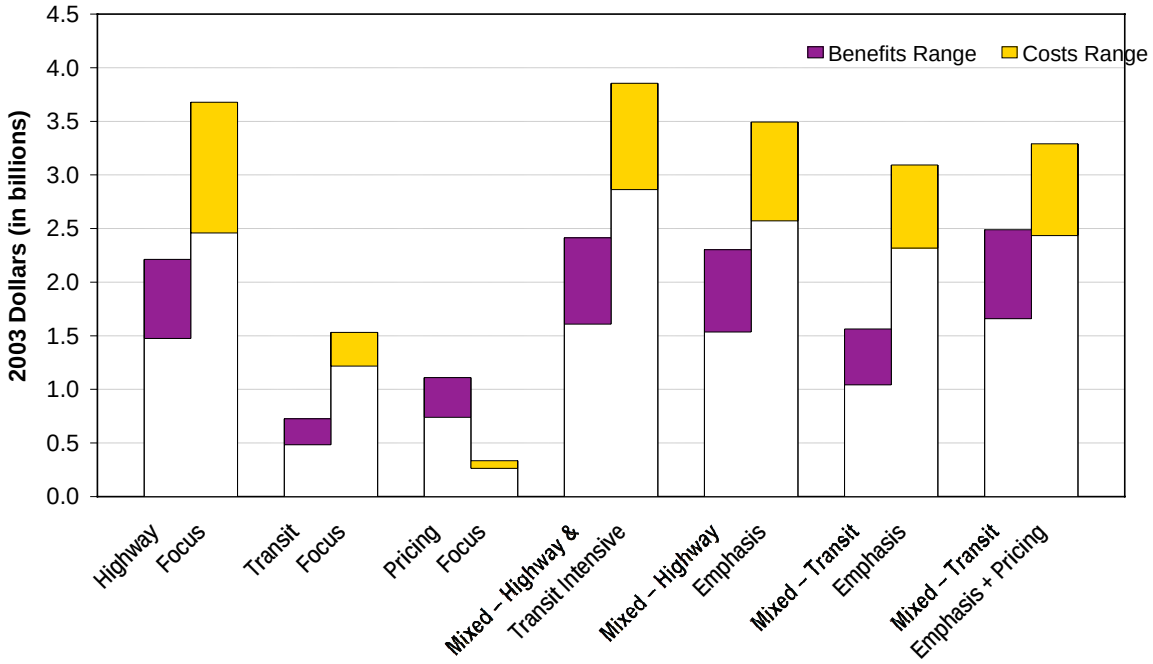
For illustrative purpose, the study modeled system wide tolling. The analysis shows that pricing is effective in managing demand and reducing delay. However, its implication on social equality and economic environment will need to be carefully evaluated in future pricing studies.

4. There is no single silver bullet in "relieving" congestion at the system level; the most practical approach for fighting the growing demand-capacity imbalance may lie in targeted (such as focusing on bottlenecks), strategic and incremental investments guided by a long-range corridor vision.

In addition to analyzing single mode scenarios, the study looked at several mixed strategies that included different levels of highway and transit investments. Transportation system efficiency improvements and selective roadway tolling were also evaluated.

Figure 4 presents the estimated 2025 annual benefits and annualized cost ranges (expressed in constant 2003 dollars) side by side for comparative purposes. It illustrates relative scale and areas of overlap for each scenario.

Figure 4. Annual Benefit and Cost Comparison for the Central Puget Sound Scenarios



Note: Benefits and costs are expressed as ranges around future expected values, expressed in constant 2003 dollars inclusive of present value discounting. Benefits exclude non-quantifiable congestion relief impacts, such as the effects on business location decisions and economic activity.

In the chart, the white sections of the bars show the lower ranges of annual benefit and cost; the colored or darker sections show the ranges or higher end of the benefit and cost. As the chart shows, for the scenarios tested, the highway investments generate more system-wide benefits per dollar of cost than do transit investments. However, none of the system wide investment scenarios without pricing produce annual benefits that exceed the corresponding annualized costs. The sheer scale of improvements envisioned in the scenarios tested may account for this result, due to diminishing returns in user benefits as more and more capacity is added at increased cost.

This analysis suggests that, as the urban areas continue to grow and cost of building transportation capacity continues to escalate, system wide congestion relief doesn't appear to be economically feasible. However, to maintain Washington's quality of life and economic vitality, the growing demand must be served. Other work done by WSDOT does indicate the strategically located corridor and bottleneck and chokepoint investments do have benefits that exceed the cost of the projects. These investments should be evaluated in a case by case situation.

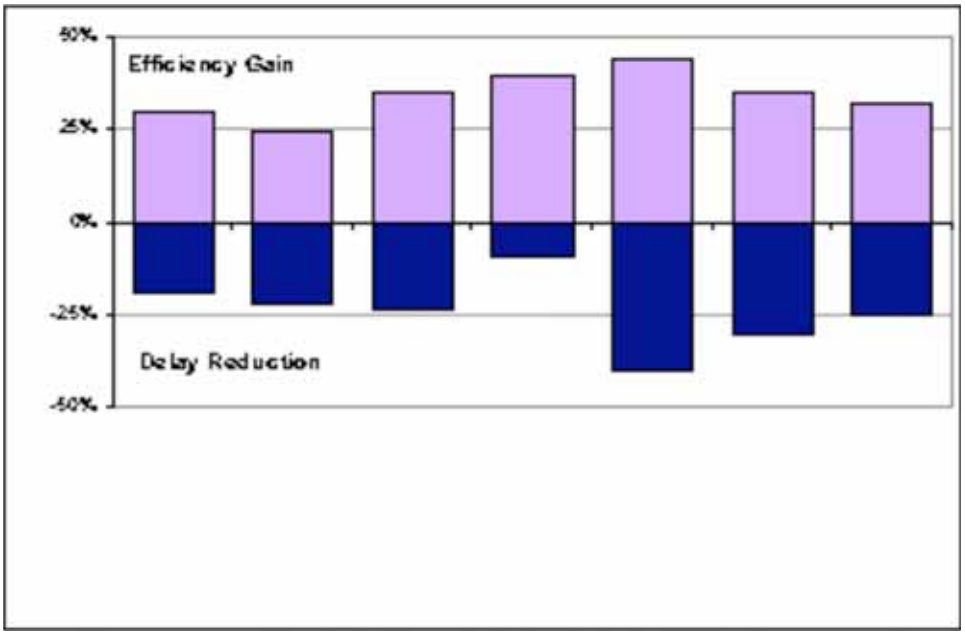
The mixed scenario plus pricing shows promising results. Adding pricing on highways to a scenario with a mix of highway and transit capacity improvements produces a large increase in benefits for a relatively minor additional cost. This suggests that a careful selection of highway and/or transit investments plus pricing would very likely yield present-value benefits in excess of associated costs. This will be further investigated in the Phase 2 of the study.

5. In the Puget Sound, system efficiency measures, particularly a HOT lane network concept holds promise

In addition to the scenarios mentioned above, the study also evaluated other options to improve system efficiency in the Puget Sound and Vancouver areas. Particularly worth noting is the analysis of a high occupancy toll (HOT) lane network in the Puget Sound.

HOT lanes use price and occupancy restrictions to manage the number of vehicles traveling on them, maximizing the volumes of vehicles while maintaining travel speed at or near the posted speed limit. HOT lanes provide travelers with a choice of paying a toll to use relatively uncongested lanes or traveling in the congested general-purpose lanes. The HOT lane network was built up from the Mixed Scenario - Transit Emphasis Scenario. It coincides with the Core HOV network, utilizing one added general-purpose lane (except SR16), combined with the existing or planned HOV lane to form two HOT lanes in each direction.

Figure 5. Potential Percent Delay Reduction and Efficiency Gain in the Peak Periods with HOT Lanes



The analysis showed that the HOT lane network would not only reduce delay, but it would also increase the system efficiency by a significant percentage (see Figure 5).

Because the current regional model is not rigorous enough to evaluate HOT strategy, the analysis was conducted external to the travel demand model. This scenario will be more thoroughly investigated in the Phase 2.

NEXT STEPS

A report is being finalized by mid February for phase 1 of the analysis. Due to modeling issues, the Spokane analysis is scheduled for completion by the end of February.

The CRA Phase 1 work drew some valuable findings and revealed several model limitations. CRA Phase 2 will focus on two important components:

1. Improve the regional models to better reflect peak spreading and mode shift in responding to changes in policy (i.e., pricing) and/or transportation supply.

2. Develop and analyze two to three additional transportation scenarios, focusing on evaluating pricing and managed lanes.

Phase 2 of the study is currently under scoping and contract negotiation. It is scheduled to start in the mid February and be completed in the fall of 2005. For more information on the Congestion Relief Analysis, please contact Michael Cumming (cumminm@wsdot.wa.gov), Shuming Yan (yans@wsdot.wa.gov), or David Forte (forted@wsdot.wa.gov).